REMARKS

Applicant respectfully requests reconsideration and allowance of all pending claims in view of the above-amendments and the following remarks.

Applicant would like to thank the Examiner for entering Applicant's amendment after final and for the indication that claim 7 is directed to allowable subject matter.

Accordingly, Applicant has added claim 12 as a new independent claim, which corresponds to dependent claim 7 rewritten into independent form including the limitations of the claims from which it depends.

Applicant requests further reconsideration of the remaining claims for the reasons discussed below.

I. NON-RESPONSIVE OFFICE ACTION, NON-COMPLIANCE WITH 37 C.F.R. §1.104(b)

The present Office Action is unresponsive to the applicants' prior response, in non-compliance with 37 C.F.R. 1.104(b). Rule 104(b) requires an examiner to make an Office Action complete as to all matters, with certain rare exceptions where appropriate (in cases such as misjoinder of invention, fundamental defects in the application, or mere formalities), none of which exceptions apply in the present case.

In particular, Applicant has twice requested a corrected, updated Form PTO 892 listing a reference as being considered. The body of the Office Action dated November 25, 2008 cites in paragraph 11, Kai-Kit Wong, A Joint-Channel Diagonalization for Multiuser MIMO Antenna Systems, IEEE Trans. on Wireless Comm., Vol. 2, No. 4 (July 2003). But, this reference is not listed on the Examiner's Form PTO 892 as being considered. The Examiner's PTO892 is therefore not compliant with MPEP §707.

In each of the previous two responses, Applicant requested a corrected PTO 892. The subsequent Office Actions do not respond to this request in any way. These Office Actions, including the present are therefore non-responsive and non-compliant with 37 C.F.R. §1.104(b).

Applicants respectfully request a corrected, updated Form PTO 892 listing this reference.

II. CLAIM REJECTIONS – 35 USC §102

Claims 1, 3-5, and 9 are rejected under 35 U.S.C. 102(e) as being allegedly anticipated by Horng et al., U.S. Patent No. 7,263,132 B2.

HORNG relates to MIMO wireless communications systems including Nr transmitting antennas, with dynamic power allocation.

According to this document, a stream of data symbols is de-multiplexed into M sub-streams (DM 103), where M=Nr/2. Then, space-time transmit diversity encoding is applied to each sub-stream to generate a pair of transmit signals (STTD 110). Power is allocated dynamically to each one of the pairs of transmitted signal according to a corresponding feedback signal received form a receiver of the transmit signal.

HORNG is not relevant toward the inventions recited in claims 1, 3-5 and 9.

Indeed, the space-time transmit diversity encoding implemented according to HORNG is a classical Alamouti scheme.

As stated according to the prior art of the discussed patent application, Alamouti scheme relies on an orthogonal space-time block code for two transmitting antennas. In other words, a STTD according to Alamouti scheme enables grouping of the data symbols by pair (X1, X2) and to transmit:

- X1 and X2 respectively on 1st and 2nd transmit antennas at a 1st time slot, and then
- –X2* and X1* respectively on the 1st and 2nd transmit antennas at a 2nd time slot.

According to HORNG, it is thus necessary to de-multiplex the stream of data symbols into M=Nr/2 sub-streams to obtain sub-streams comprising only two data symbols, in order to use the Alamouti scheme. In this way, the data symbols inputted in the STTD encoder 110 according to HORNG are always grouped by pair (X1, X2), which allows the use of two transmitting antennas simultaneously, to transmit the symbols X1 and X2 during the 1st time slot and –X2* and X1* during the 2nd time slot.

The STTD according to HORNG is thus classical, and belongs to the state of the art as

disclosed in the discussed patent application. This is also confirmed by the fact that the STTD technique used in HORNG is not described in detail.

The STTD according to HORNG is also restricted to the use of two transmitting antennas per encoder, whereas according to the discussed invention a greater number of transmitting antennas can be used (four antennas for example).

A. **No Disclosure of Division into Nt Sub-Vectors**

More precisely, HORNG does not disclose nor suggest a step of dividing a vector (comprising N symbols to be sent) into Nt sub-vectors.

Indeed, according to block 110, Figure 1 of HORNG, the symbols inputted in the STTD encoder are X1 and X2, and the symbols outputted form the STTD encoder are X1 and –X2* on a first path, and X2 and X1* on a second path.

However, if the vector (X1, X2) comprising the symbols inputted in the STTD encoder was divided into two sub-vectors, the symbols outputted form the STTD encoder on the first path would be determined according to the symbol X1 only (for example X1 and –X1*, or X1 and X1*), and the symbols outputted form the STTD encoder on the second path would be determined according to the symbol X2 only (for example X2 and –X2*, or X2 and X2*).

The step of "dividing said vector into Nt sub-vectors" is thus new and non obvious in view of HORNG.

One might attempt to consider that the step of dividing the vector into Nt sub-vectors is disclosed by the demultiplexing stage 103 according to HORNG.

Stage 103 allows the demultiplexing of a stream of data symbols into M sub-streams. The number M of sub-streams (or sub-vectors) according to HORNG is equal to half of the number of transmitting antenna (M=Nr/2, column 1, lines 60-64).

On the contrary, according to the present claims, the number Nt of sub-vectors is equal to the number of transmitting antenna Nt.

The step of "dividing said vector into Nt sub-vectors" is thus still new and non obvious in view of HORNG.

B. **No Disclosure of Multiplying by a Distinct Sub-Matrix**

HORNG also does not disclose the step of multiplying each of the Nt sub-vectors by a

distinct sub-matrix.

Indeed, according to the Examiner, the matrix $\begin{bmatrix} X1 & -X2* \\ X2 & X1* \end{bmatrix}$ according to equation 1 of HORNG is the unitary square matrix sized NxN according to claim 1 of the discussed invention. A first sub-matrix is thus defined by the row $\begin{bmatrix} X1 & -X2* \end{bmatrix}$ and a second sub-matrix is defined by the row $\begin{bmatrix} X2 & X1* \end{bmatrix}$.

If we follow the Examiner's analysis, this would mean that the first sub-vector X1 is multiplied by the first sub-matrix $\begin{bmatrix} X1 & -X2* \end{bmatrix}$, and the second sub-vector X2 is multiplied by the second sub-matrix $\begin{bmatrix} X2 & X1* \end{bmatrix}$. This would lead to <u>a multiplication between symbols</u>, leading to a non-linear system, which is not the case according to an example of Applicant's claims.

As a consequence, the matrix $\begin{bmatrix} X1 & -X2* \\ X2 & X1* \end{bmatrix}$ can not be considered as the unitary square matrix that can be subdivided in sub-matrices according to the discussed claims. This matrix is a matrix formed by the vectors resulting from the multiplying step.

The Applicant would like to remind the Examiner that according to the discussedclaims, a vector of N symbols is divided into Nt sub-vectors, and each of these Nt sub-vectors are multiplied by a distinct sub-matrix. In other words, for example, if we consider:

- a vector $X = (x_0, x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9)$, for $N = 10$,
- two sub-vectors $X1 = (x_0, x_1, x_2, x_3, x_4)$ and $X2 = (x_5, x_6, x_7, x_8, x_9)$, for $Nt = 2$, and
- a unitary square matrix A sized $(N, N) = (10,10)$ such that:

$$A = \begin{pmatrix} a_0 & a_1 & \cdots & a_9 \\ a_{10} & a_{11} & \cdots & a_{19} \\ \vdots & \vdots & \ddots & \vdots \\ a_{90} & a_{91} & \cdots & a_{99} \end{pmatrix},$$

- two sub-matrices sized $(N / Nt, N) = (5,10)$, called *A1* (sub-matrix associated with the 1st transmitting antenna) and *A2* (sub-matrix associated with the 2nd

transmitting antenna,

then we have:

- a first sub-vector *X1'* resulting from the multiplication of *X1* by *A1*, and
- a second sub-vector *X2'* resulting from the multiplication of *X2* by *A2*.

The first sub-vector *X1'* can then be sent by the 1st transmitting antenna, and the second sub-vector X2' can be sent by the 2nd transmitting antenna.

As a consequence, the unitary square matrix according to the discussed claims can be considered, for example, as an encoding matrix comprising real or complex coefficients a_{ij} (for example a real Hadamard matrix, a complex Hadamard or Fourier matrix, any real or complex rotation matrix, etc). This matrix can be subdivided in sub-matrices each associated with one transmitting antenna, and each sub-vector obtained by dividing the vector of symbols into Nt sub-vectors can be multiplied by a distinct sub-matrix, in order to obtain Nt new sub-vectors resulting from the multiplying step.

The square unitary matrix according to the discussed invention is thus not formed with symbols to be sent (or linear combination of symbols to be sent), for example.

The step of "multiplying each of the Nt sub-vectors by a distinct sub-matrix" is thus new and non obvious in view of HORNG.

As a consequence, HORNG is not relevant toward the discussed invention. The STTD encoding technique disclosed in HORNG belongs to the state of the art as described in the discussed patent application.

It should also be noted that an example of the discussed invention imposes no conditions on the channel, as the proposed encoding does not require the channel to be constant for the duration of the code (which is the case for Alamouti scheme).

Claims 1, 3-5 and 9 are thus allowable not anticipated by HORNG.

III. <u>CLAIM REJECTIONS – 35 USC § 103</u>

Claims 6 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horng et al., U.S. Patent No. 7,263,132 B2, as applied to claim 1 above, and further in view of Hottinen et al., U.S. Patent No. 7,436,896 B2.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Horng et al., U.S. Patent No. 7,263,132 B2, as applied to claims 1 and 9 above, and further in view of Agrawal et al., U.S. Patent No. 6,873,606 B2.

Neither HOTTINEN, nor AGRAWAL, discloses or suggests the ideas of:

- dividing a unitary square matrix in order to obtain a set of sub-matrices, each sub-matrices being associated with a different transmit antenna,
- multiplying each of the sub-vectors by a distinct sub-matrix, and
- sending the resulting sub-vector using the transmit antenna associated with the corresponding sub-matrix.

As a consequence, HOTTINEN and AGRAWAL, taken alone or in combination with HORNG, are not relevant toward the inventions recited in claims 6, 8 and 10.

All pending claims are therefore new and non-obvious in view of the cited references.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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